UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,995	11/26/2003	Li Deng	M61.12-0581	7996

27366 7590 11/26/2007

WESTMAN CHAMPLIN (MICROSOFT CORPORATION)
SUITE 1400
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MN 55402-3319

EXAMINER	
WOZNIAK, JAMES S	

ART UNIT	PAPER NUMBER
2626	

MAIL DATE	DELIVERY MODE
11/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/723,995	DENG ET AL.	
	Examiner	Art Unit	
	James S. Wozniak	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6-18 and 20-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-18 and 20-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the office action from 7/12/2007, the applicant has submitted an amendment, filed 9/18/2007, amending independent claims 1 and 14, while arguing to traverse the art rejection based on the limitations regarding a non-linear observation equation that consists of two non-linear functions that are approximated by two linear functions *(Amendment, Page 8)*. Applicant's arguments have been fully considered, however the previous rejection is maintained due to the reasons listed below in the response to arguments.

2. In response to amended claim 22, the examiner has withdrawn the previous objection directed towards minor informalities.

3. In response to the amendments of claim 14, the examiner has withdrawn the previous 35 U.S.C. 101 rejection directed towards non-statutory subject matter.

Response to Arguments

4. Applicant's arguments have been fully considered but they are not persuasive for the following reasons:

With respect to Claim 1, the applicant argues that Dusan *("Statistical Estimation of Articulatory Trajectories from the Speech Signal Using Dynamical and Phonological Constraints," 2000)* fails to teach forming a linear approximation from the product of two functions that are each respective linear approximations of two non-linear functions with respect to the vocal tract resonance vector and Takizawa et al *(U.S. Patent: 5,361,324)* fails to teach forming a linear approximation for either of the two non-linear functions (Amendment, Page 8).

In response, the examiner notes that the aforementioned claim limitations are provided by a combination of the teachings of Dusan and Takizawa. Dusan teaches the ability to define a linear approximation for a non-linear observation equation relating to an acoustic observation *(Pages 99-100)*. Dusan mentions that an acoustic observation can be defined in terms of cepstrum coefficients *(Page 73)*, but fails to define a function used to determine such coefficients. Takizawa, however, discloses such a well-known cepstral coefficient calculation, which consists of a product of two non-linear functions *(Col. 6, Lines 53-64)*, a cosine and exponential. Although Dusan teaches that a linear approximation is the result of a Taylor series expansion, as is pointed out by the applicant *(Amendment, Page 8)*, the Taylor series expansion is not performed on the entire function in Takizawa *(Amendment, Page 8)*, instead it is a first-order expansion *(Page 99)* that would still involve the product of two linear approximations as a result of the expansion processing. Thus, it is the combination of Dusan and Takizawa that teaches the aforementioned claim limitations. It is worth noting that although the specific linear approximation calculation utilized by the applicant may be different from that used in the combination of Dusan and Takizawa *(Eq. 4 is a linear approximation of Eq. 3, See Pages 13 and 16 of the specification)*, such a specific calculation is not recited in the presently claimed

invention. Therefore, amending claim 1 to incorporate such a calculation may be sufficient to overcome the teachings of Dusan and Takizawa.

The art rejection of claim 14 and the remainder of the dependent claims is traversed for reasons similar to Claim 1 *(Amendment, Pages 8-9)*. In regards to such arguments, see the response directed towards claim 1.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claims 1-3, 6-18, and 20-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Dusan in view of Takizawa et al *(U.S. Patent: 5,361,324)*.

With respect to **Claim 1**, Dusan discloses:

Defining a state equation that is linear with respect to a past vocal tract resonance vector and that predicts a current vocal tract resonance vector *(linear state equation, pp. 70-73; and pp. 99-100)*;

Defining an observation equation that is linear with respect to a current vocal tract resonance vector and that predicts at least one component of an observation vector *(linearization of a vocal tract observation equation, pp. 99-100)*; and

Using the state equation, the observation equation, and a sequence of observation vectors to identify a sequence of vocal tract resonance vectors, each vocal tract resonance vector comprising at least one vocal tract resonance frequency *(vocal tract formant prediction utilizing the linear state equation, the linear observation equation, and a sequence of observation vectors, pp. 101-104).*

Although Dusan discloses the use of cepstrum parameters *(p. 73)*, Dusan does not explicitly recite a non-linear equation for calculating cepstrum coefficients, wherein the non-linear equation comprises the product of a sinusoidal function with an exponential function. Takizawa, however, recites such a cepstrum coefficient equation *(Col. 6, Lines 53-64).*

Dusan and Takizawa are analogous art because they are from a similar field of endeavor in vocal tract analysis. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Dusan with the cepstrum coefficient calculation concept taught by Takizawa in order to provide a well-known method for easily calculating a vocal tract parameter that is stable for recognition *(Takizawa, Col. 5, Lines 32-34).*

With respect to **Claim 2**, Dusan further discloses:

Using the state equation, the observation equation, and the sequence of observation vectors to identify a sequence of vocal tract resonance vectors comprises applying the state equation, the observation equation and the sequence of observation vectors to a Kalman Filter *(Kalman filtering, pp. 101-104).*

With respect to **Claim 3**, Dusan further discloses:

Identifying a vocal tract resonance vector comprises identifying a vocal tract resonance vector from a continuous set of values *(vocal tract formant estimation for continuous speech, p. 89)*.

With respect to **Claims 6-7**, Takizawa discloses the exponential and sinusoidal functions as applied to Claim 1.

With respect to **Claim 8**, Dusan further discloses:

Defining a linear approximation comprises selecting a linear approximation from a set of linear approximations that together form a piecewise linear approximation to the non-linear function *(forming a piecewise linear approximation of a vocal tract using codebooks, abstract and p. 82)*.

With respect to **Claim 9**, Dusan further discloses:

Evaluating the non-linear function based on an estimate of a vocal tract resonance vector to produce a non-linear function value and using the non-linear function value to select parameters for the linear approximation *(using an estimated formant observation vector in a codebook look-up process, pp. 79-82)*.

Claim 10 contains subject matter similar to Claims 8-9, and thus, is rejected for the same reason.

With respect to **Claim 11**, Dusan further discloses:

Using the identified vocal tract resonance vectors to redefine the observation equation; and using the redefined observation equation, the state equation, and the observation vectors to identify a new sequence of vocal tract resonance vectors *(iterative Kalman filter, pp. 101-102)*.

With respect to **Claim 12**, Dusan further discloses:

The observation equation comprises using an identified vocal tract resonance vector to select parameters for at least one linear approximation to a function that is non-linear with respect to a vocal tract resonance vector *(re-linearization utilizing previous state parameters, p. 102 and pp. 99-100)*.

Claim 13 contains subject matter similar to Claims 10 and 12, and thus, is rejected for the same reasons.

With respect to **Claim 14**, Dusan discloses:

Using an estimate of at least one vocal tract resonance component to select a linear approximation to a function that is non-linear with respect to the vocal tract resonance component *(forming a piecewise linear approximation of a vocal tract using codebooks, abstract and p. 82 and linearization of a vocal tract observation equation, pp. 99-100)*;

Using the linear approximation to define an observation equation *(linearization of a vocal tract observation equation, pp. 99-100)*; and

Using the observation equation and at least one observed vector to re-estimate the vocal tract resonance component *(vocal tract correction and iterative smoothing using a Kalman filter, pp. 101-102)*.

Dusan further discloses method implementation as a program running on a computer *(p. 102)*, which would inherently require some type of computer readable medium for program storage.

Although Dusan discloses the use of cepstrum parameters *(p. 73)*, Dusan does not explicitly recite a non-linear equation for calculating cepstrum coefficients, wherein the non-

linear equation comprises the product of a sinusoidal function with an exponential function. Takizawa, however, recites such a cepstrum coefficient equation *(Col. 6, Lines 53-64)*.

Dusan and Takizawa are analogous art because they are from a similar field of endeavor in vocal tract analysis. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Dusan with the cepstrum coefficient calculation concept taught by Takizawa in order to provide a well-known method for easily calculating a vocal tract parameter that is stable for recognition *(Takizawa, Col. 5, Lines 32-34)*.

Claim 15 contains subject matter similar to Claim 8, and thus, is rejected for the same reasons.

Claim 16 contains subject matter similar to Claim 9, and thus, is rejected for the same reasons.

With respect to **Claim 17**, Dusan discloses the linear state equation as applied to Claim 1.

With respect to **Claim 18**, Dusan discloses the Kalman filter as applied to Claim 14.

Claims 20-21 contain subject matter similar to Claims 6-7, and thus, are rejected for the same reasons.

Claim 22 contains subject matter similar to Claim 3, and thus, is rejected for the same reasons.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James S. Wozniak whose telephone number is (571) 272-7632. The examiner can normally be reached on M-Th, 7:30-5:00, F, 7:30-4, Off Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached at (571) 272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James S. Wozniak
11/5/2007

PATRICK N. EDOUARD
SUPERVISORY PATENT EXAMINER